

We Claim:

1. A method of improving glyphosate tolerance in a wheat plant comprising:

(1) constructing a DNA construct comprising a first and a second expression cassette,
5 wherein said first expression cassette in operable linkage comprises (i) a rice actin 1 promoter;
(ii) a rice actin 1 intron; (iii) a chloroplast transit peptide encoding DNA molecule; (iv) a
glyphosate tolerant EPSPS encoding DNA molecule; and (v) a transcriptional terminator DNA
molecule; and said second expression cassette comprising in operable linkage (a) a CaMV 35S
promoter; (b) a Hsp70 intron; (c) a chloroplast transit peptide encoding DNA molecule; (d) a
10 glyphosate tolerant EPSPS encoding DNA molecule; and (e) a transcriptional terminator DNA
molecule; and

(2) transforming a wheat cell with said DNA construct; and

(3) regenerating said wheat cell into a wheat plant; and

(4) treating said wheat plants with an effective dose of glyphosate; and

15 (5) selecting fertile wheat plants that are vegetative and reproductive tolerant to glyphosate.

2. A fertile glyphosate tolerant wheat plant produced by the method of claim 1.

3. The progeny seeds of the glyphosate tolerant wheat plant of claim 2.

4. A DNA molecule isolated from the fertile glyphosate tolerant wheat plant of claim 2
comprising a nucleotide sequence identified as SEQ ID NO:5.

20 5. A DNA molecule isolated from the fertile glyphosate tolerant wheat plant of claim 2
comprising a nucleotide sequence identified as SEQ ID NO:6.

6. A pair of DNA molecules comprising: a first DNA molecule and a second DNA molecule,
wherein the first DNA molecule is of sufficient length of contiguous nucleotides from the wheat
genomic sequence of SEQ ID NO:5 or its complement to function as a DNA primer, and the
25 second DNA molecule is of sufficient length of contiguous nucleotides from the insert sequence
of SEQ ID NO:5 or its complement to function as a DNA primer, and the pair of DNA
molecules when used in a DNA amplification method produce an amplicon diagnostic for DNA
extracted from glyphosate tolerant wheat plant 33391 or progeny thereof.

7. A pair of DNA molecules comprising: a first DNA molecule and a second DNA molecule, wherein the first DNA molecule is of sufficient length of contiguous nucleotides from the wheat genomic sequence of SEQ ID NO:6 or its complement to function as a DNA primer, and the second DNA molecule is of sufficient length of contiguous nucleotides from the insert sequence of SEQ ID NO:6 or its complement to function as a DNA primer, and the pair of DNA molecules when used in a DNA amplification method produce an amplicon diagnostic for DNA extracted from glyphosate tolerant wheat plant 33391 or progeny thereof

8. A method of detecting the presence of a DNA molecule diagnostic for glyphosate tolerant wheat plant 33391 or progeny thereof, the method comprising:

- (a) extracting a DNA sample from said wheat plant 33391 or progeny seeds and plants or parts thereof; and
- (b) providing DNA primer molecules SEQ ID NO:7 and SEQ ID NO:8; and
- (c) providing DNA amplification reaction conditions; and
- (d) performing said DNA amplification reaction, thereby producing a DNA amplicon molecule; and
- (e) detecting the DNA amplicon molecule.

9. In the method of claim 8, the DNA amplicon molecule comprising the DNA molecules of SEQ ID NO:7 and SEQ ID NO:8.

10. A method of detecting the presence of SEQ ID NO:5 DNA molecule in a DNA sample, the method comprising:

- (a) extracting a DNA sample from a wheat plant;
- (b) contacting the DNA sample with a DNA molecule that spans the junction region of wheat 33391 genomic DNA and insert DNA of SEQ ID NO:5, wherein said DNA molecule is a DNA probe that hybridizes under stringent hybridization conditions with the DNA molecule SEQ ID NO:5; and
- (c) subjecting the sample and probe to stringent hybridization conditions; and detecting hybridization of the probe to the DNA.

11. A method of detecting the presence of SEQ ID NO:6 DNA molecule in a DNA sample, the method comprising:

- (a) extracting a DNA sample from a wheat plant;
- (b) contacting the DNA sample with a DNA molecule that spans the junction region of wheat 33391 genomic DNA and insert DNA of SEQ ID NO:6, wherein said DNA molecule is a DNA probe that hybridizes under stringent hybridization conditions with the DNA molecule SEQ ID NO:6; and
- (c) subjecting the sample and probe to stringent hybridization conditions; and detecting hybridization of the probe to the DNA.

12. A method of breeding a glyphosate tolerant trait into wheat plants comprising:

- a) crossing wheat 33391 glyphosate tolerant progeny with non glyphosate tolerant wheat plants; and
- b) producing progeny wheat plants of the cross; and
- a) extracting a DNA sample from progeny wheat plants;
- b) contacting the DNA sample with a marker nucleic acid molecule that hybridizes to SEQ ID NO:5 or SEQ ID NO:6 or complements thereof; and
- c) performing a marker assisted breeding method for the glyphosate tolerant trait, wherein the glyphosate tolerant trait is genetically linked to a complement of the marker nucleic acid molecule.

13. A DNA detection kit comprising: at least one DNA molecule of sufficient length of contiguous nucleotides homologous or complementary to SEQ ID NO:5 or SEQ ID NO:6 that functions as a DNA primer or probe specific for wheat event 33391 and its progeny.

14. A method of detecting wheat event 33391 and progeny thereof comprising: (a) extracting a sample of wheat event 33391 for protein; and (b) assaying extracted protein by an immunological based method containing antibodies specific for the CP4 EPSPS protein; and (c) detecting the reaction of the antibodies with the CP4 EPSPS protein.

15. A wheat seed designated 33391 and having ATCC Accession No. PTA-2347.

16. A wheat plant or its parts produced by growing the seed of claim 15.

17. A wheat plant of claim 16, wherein said wheat plant is tolerant to glyphosate.

18. A wheat plant, or its parts, wherein at least one ancestor of said wheat plant is the wheat plant, or its parts, of claim 17.

19. A method of producing a wheat plant that tolerates application of glyphosate comprising:

(a) sexually crossing a first wheat plant grown from the wheat seed 33391 having ATCC Accession No. PTA-2347 that confers tolerance to application of glyphosate, and a second wheat plant that lacks the tolerance to glyphosate, thereby producing a plurality of first progeny plants; and

(b) selecting a first progeny plant that is tolerant to application of glyphosate; and

(c) selfing said first progeny plant, thereby producing a plurality of second progeny plants; and

(d) selecting from said second progeny plants a glyphosate tolerant plant second progeny plant.

20. The method of claim 19 further comprising the steps of back-crossing the first progeny plant that is glyphosate tolerant or the glyphosate tolerant second progeny plant to any non-glyphosate tolerant wheat plant; and selecting progeny thereof for tolerance to glyphosate.

21. A method for selectively controlling weeds in a field containing a wheat crop having planted wheat 33391 seeds or seeds of progeny thereof comprising the steps of:

(a) planting the wheat 33391 seeds or progeny thereof that are glyphosate tolerant; and

(b) applying to the wheat crop and weeds in the field a sufficient amount of glyphosate herbicide to control the weeds without significantly affecting the wheat crop.